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Transport of space charge dominated e-beams produced by laser-plasma accelerators G. FUBIANI, LBNL, W. P. LEEMANS, LBNL, J. QIANG, LBNL, E. H. ESAREY, LBNL, G. DUGAN, Cornell Laser driven accelerators are capable of producing multi nC, multi MeV electron beams with transverse and longitudnal sizes on the order of microns. To investigate the transport of such electron bunches, a variety of codes have been developed including a fast and fully relativistic semi-analytical model, an hybrid particle-in-cell (PIC) method based on a Poisson solver and also a 3-D point to point interaction code. Such codes have the ability to handle arbitrary electron distributions, e.g., large energy spreads and non uniform densities. Simulations of e-beams emerging from a self-modulated laser-wakefield-accelerator (SMLWFA) will be shown. The SMLWFA relies on an instablility to inject the electrons into the plasma wave via wavebreaking. Because the electrons are injected into the wakefield in an uncontrolled manner, the resulting bunch has a large energy spread, characterized by an exponential distribution in energy with a mean of 4 MeV. The bunch also has a high charge 2-4 nC, with typical dimensions 10 microns, giving a high number density and concequently a space charge dominated dynamics. The beam undergoes space charge blow up after existing the plasma, which significanlty modifies the energy distribution. Simulating transport of such beams is essential to understand the measurements made far from the plasma, and to assess future applications for plasma accelerators.

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